

PATENT COOPERATION TREATY

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PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing:

28 March 2002 (28.03.02)

International application No.:

PCT/IB01/00325

Applicant's or agent's file reference:

PA130483/PCT

International filing date:

08 March 2001 (08.03.01)

Priority date:

21 September 2000 (21.09.00)

Applicant:

CREIGHTON, Barry, Roger et al

1. The designated Office is hereby notified of its election made:



in the demand filed with the International preliminary Examining Authority on:

04 December 2001 (04.12.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
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1211 Geneva 20, Switzerland

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PATENT COOPERATION TREATY

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REC'D 16 JAN 2003

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PA130483/PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB01/00325	International filing date (day/month/year) 08/03/2001	Priority date (day/month/year) 21/09/2000
International Patent Classification (IPC) or national classification and IPC H01Q1/12		
Applicant CREIGHTON, Barry Roger et al.		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of ³~~4~~ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 04/12/2001	Date of completion of this report 14.01.2003
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Van der Peet, H Telephone No. +49 89 2399 2764 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IB01/00325

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-8 as originally filed

Claims, No.:

1-17 as received on 24/06/2002 with letter of 24/06/2002

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IB01/00325

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 4-17.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☒ the claims, or said claims Nos. 4-17 are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Yes: Claims 1-3

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IB01/00325

	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-3
Industrial applicability (IA)	Yes:	Claims	1-3
	No:	Claims	

2. Citations and explanations
see separate sheet

In order to facilitate easy reference the documents cited in the International Search Report are numbered *seriatim* (D1 to D3).

1. The present application addresses the unsightly aspects of prior art telecommunications mast installations. In particular buildings alongside the mast needing a fence are considered unsightly. The problem is solved by situating the building accommodating equipment underground. The person skilled in the art commissioned with the task of solving the problem would consult document D1 (CA-A-22206062) and thus recognise that the mast installations shown on the page entitled "Monopole 120', 100' et 80' implantation" solve the problem. The left hand figure on the page mentioned discloses in fact:

a telecommunications mast installation comprising a mast (monopole) supporting a telecommunications antenna and a foundation structure supporting the mast, the foundation structure comprising an enclosed chamber (abri) situated underground, the chamber defining an internal space which is accessible to personnel and which accommodates electronic equipment (cf. "vue en plan intérieur de l'abri") associated with operation of the antenna (radio equipment and cables), the mast with a foot at the lower end supported by a base of the chamber which acts as structural foundation (fondation) for the mast.

The known mast does not pass through the roof of the chamber and the subject matter of claim 1 is hence novel. This undisclosed feature has, however, no bearing on the solution of the technical problem and is in fact one of two alternatives open to the skilled man. Claim 1 does not therefore involve an inventive step (Article 33(3) PCT).

2. The features of claims 2 and 3 are known from document D1.
3. Present claim 4 alludes to the roof as serving as lateral support means. This feature is not derivable from the original disclosure (in particular the original claims). Claim 4 thus offends the proscription of Article 34(1)b, last sentence (PCT). A similar observation holds for claim 5 in respect of the feature concerning the absence of any transfer of bending moments and for claims 7 to 17 (being dependent on claims 4 and 5).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB01/00325

4. In the letter of 24.6.2002 it was submitted on behalf of the applicants that the monopole mast is fixedly connected to the roof of an underground chamber. This is clearly not the case with the chamber (abri) referred to above. The argument concerning increased costs due to the alleged catering for bending moments is accordingly rejected as unfounded.
5. Having regard to the fact that the technical problem of the present application is exhaustively solved by the technical teaching of document D1, the present application does not seem to contain subject matter which could afford a basis for a claim which is both novel and inventive.

CLAIMS

1.

A telecommunications mast installation comprising a mast supporting a telecommunications antenna and a foundation structure supporting the mast, the foundation structure comprising an enclosed chamber situated at least partially underground, the chamber defining an internal space which is accessible to personnel and which accommodates electronic equipment associated with operation of the antenna, the mast passing through a roof of the chamber with a foot at the lower end of the mast supported by a base of the chamber which acts as a structural foundation for the mast.

2.

An installation according to claim 1 wherein the chamber is fully underground.

3.

An installation according to either one of the preceding claims wherein the foot of the mast is seated on a seat in or on the base, the seat restraining lateral movements of the foot of the mast at the base.

4.

An installation according to claim 2 or claim 3 wherein the roof of the chamber has an opening therein through which the mast passes, the roof serving as a lateral support means to restrain lateral movements of the mast at a position above the base.

5.

An installation according to claim 4 wherein the base and roof of the chamber restrain lateral movements of the mast without any transfer of bending moments between the mast and the foundation structure.

6.

An installation according to claim 4 or claim 5 comprising a sleeve about a lower end of the mast, the sleeve being received by the seat and passing through the opening in the roof.

7.

An installation according to any one of the preceding claims and comprising ventilation or air conditioning means for the interior of the chamber.

8.

An installation according to claim 7 comprising ventilation or air conditioning means housed in a cubicle mounted on a roof of the chamber above ground level and communicating with the interior of the chamber.

9.

An installation according to claim 7 wherein the ventilation means comprises a ventilation circuit which includes an air intake on the mast above ground, an air exhaust at an elevated position on the mast, air intake ducting leading from the intake to the interior of the chamber and air exhaust ducting leading from the interior of the chamber to the air exhaust.

10.

An installation according to claim 9 wherein the air exhaust is located towards the top of the mast and includes an air extractor.

11.

An installation according to either one of claims 9 or 10 wherein the mast is a hollow monopole mast, the air intake is an opening in a wall of the mast and the air intake and air exhaust ducting is concealed in the interior of the mast.

12.

An installation according to any one of the preceding claims comprising a personnel entrance cubicle on a roof of the chamber above ground and a personnel access passage leading from the entrance cubicle to the interior of the chamber.

13.

An installation according to any one of claims 1 to 10 wherein the mast is a hollow monopole mast which extends into the chamber and which has personnel access openings into the mast above ground and within the chamber, the personnel access openings and the interior of the mast providing a personnel access passage to the chamber.

14.

An installation according to any one of the preceding claims wherein the chamber is of concrete.

15.

An installation according to claim 14 wherein the chamber is at least partially of precast concrete construction.

16.

An installation according to any one of the preceding claims wherein the mast carries one or more transverse, electric light-supporting arms each at an elevated position, electrical supply cables for the or each arm extending along the mast.

17.

An installation according to any one of the preceding claims wherein the chamber is located underground in an area alongside a road or between opposing lanes of a road.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PA130483/PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/IB 01/ 00325	International filing date (day/month/year) 08/03/2001	(Earliest) Priority Date (day/month/year) 21/09/2000
Applicant CREIGHTON, Barry Roger		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

4



None of the figures.

EXPRESS MAIL NO. EL 859 244 93705

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 01/00325

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H01Q1/12 H01Q1/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2 206 062 A (JOVIN COMMUNICATIONS INC) 6 December 1998 (1998-12-06) the whole document ----	1-3, 8-10, 14, 18-20
A	DE 197 01 229 A (LANGMATZ LIC GMBH) 23 July 1998 (1998-07-23) abstract ----	1-20
A	GB 2 289 827 A (MOTOROLA LTD) 29 November 1995 (1995-11-29) abstract -----	9-13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

15 August 2001

Date of mailing of the international search report

22/08/2001

Name and mailing address of the ISA

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Wattiaux, V

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 01/00325

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CA 2206062	A	06-12-1998	NONE	
DE 19701229	A	23-07-1998	NONE	
GB 2289827	A	29-11-1995	NONE	

10/030806

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 March 2002 (28.03.2002)

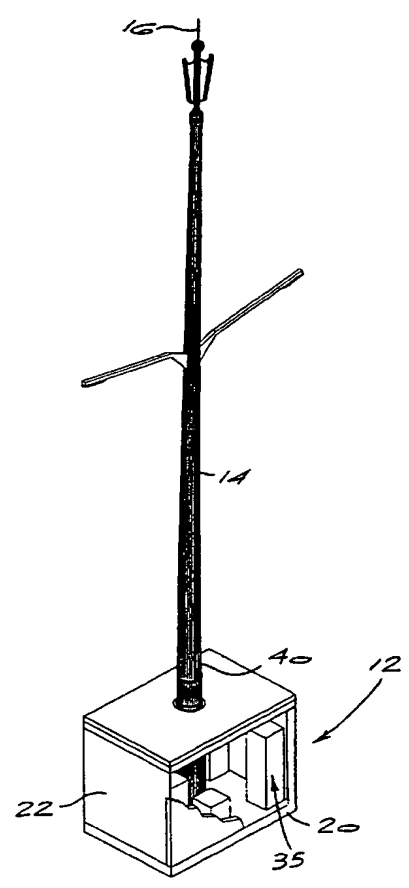
PCT

(10) International Publication Number
WO 02/25768 A1

- (51) International Patent Classification⁷: **H01Q 1/12, 1/24** (74) Agents: **GILSON, David, Grant et al.**; Spoor and Fisher, P.O. Box 41312, 2024 Craighall (ZA).
- (21) International Application Number: **PCT/IB01/00325**
- (22) International Filing Date: **8 March 2001 (08.03.2001)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
2000/5067 21 September 2000 (21.09.2000) **ZA**
- (71) Applicants and
(72) Inventors: **CREIGHTON, Barry, Roger [ZA/ZA]**; 115 Leadwood Crescent, Moreleta Park Extension 36, 0044 Pretoria (ZA). **PRETORIUS, Jock, Milne [ZA/ZA]**; 421 Beatrice Mare Street, Garsfontein Extension 8, 0042 Pretoria (ZA).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: TELECOMMUNICATIONS MAST INSTALLATION



(57) Abstract: The invention concerns a telecommunications mast installation (10), typically a base station in a cellular telephone network, which includes a mast (14) supporting a telecommunications antenna (16). A foundation structure (12) supports the mast. The foundation structure is in the form of an enclosed chamber (24) situated at least partially underground and defining an internal space which is accessible to personnel and which accommodates electronic equipment associated with operation of the antenna. For aesthetic and security reasons, it is preferred that the chamber (24) be completely underground.

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WO 02/25768 A1



Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TELECOMMUNICATIONS MAST INSTALLATION

THIS invention relates to a telecommunications mast installation.

The invention is particularly concerned with a telecommunications mast installation in which a telecommunications mast supports one or more elevated antennas. The mast itself may be of monopole, lattice or other construction and may be made of steel or other materials. A typical example where the invention finds application is in the base station installations of cellular telephone networks.

Commonly a cellular telephone network base station installation includes a fenced or otherwise externally secured area in which are located an antenna-supporting mast supported on its own foundation and an exposed building alongside the mast which houses necessary electronic and other equipment, associated with the operation of the antenna including, for example, radio transmission and reception equipment.

It is recognised that base station installations of the type described above are extremely unsightly. In an attempt to address this problem, antenna-supporting masts have in the past been disguised as trees. Although this goes some way to addressing the problem, it still does not address the unsightliness of the external fencing and the building which accommodates the antenna-related equipment.

SUMMARY OF THE INVENTION

According to the present invention there is provided a telecommunications mast installation comprising a mast supporting a telecommunications antenna and a foundation structure supporting the mast, the foundation structure being in the form of an enclosed chamber situated at least partially, and preferably fully, underground and defining an internal space which is accessible to personnel and which accommodates electronic equipment associated with operation of the antenna.

In the preferred embodiments, the mast has a foot at its lower end which is supported on a base of the chamber, the base acting as a structural foundation for the mast. Typically in such embodiments, the foot of the mast is received by a seat in or on the base, the seat restraining lateral movements of the foot of the mast at the base. The seat may be in the form of a recess in the base. Typically also, the chamber includes lateral support means to restrain lateral movements of the mast at a position above the base. The chamber will preferably have a roof, at or slightly below ground level, with an opening therein through which the mast passes. There may be a sleeve about a lower end of the mast, the sleeve being received by the seat and passing through the opening in the roof.

In alternative, less preferred embodiments, the mast has a foot at its lower end which is connected rigidly to a roof of the chamber.

In either type of embodiment, it will be understood that the chamber forms an integrated structure which supports the mast and that the construction thereof will be in accordance with accepted civil engineering principles bearing in mind firstly the expected vertical and lateral loading the requirement that there should be no flooding of the chamber in view of the equipment accommodated therein. With the latter requirement in mind it is preferred that external access to the chamber, for example for personnel should be via openings above ground level, as described below.

The installation may include ventilation or air conditioning means for the interior of the chamber. In one version of the invention ventilation or air conditioning means are housed in a cubicle mounted on a roof of the chamber above ground level and communicating with the interior of the chamber. In other versions, the ventilation means may comprise a ventilation circuit which includes an air intake at an elevated position on the mast, an air exhaust at an elevated position on the mast, air intake ducting leading from the intake to the interior of the chamber and air exhaust ducting leading from the interior of the chamber to the air exhaust. In such versions it is preferred that the air exhaust be located towards the top of the mast and include an air extractor. It is also preferred that the mast be a hollow monopole mast with the air intake and air exhaust ducting is concealed in the interior of the mast.

Personnel access to the interior of the chamber is required for equipment maintenance or installation or other purposes. The invention envisages an arrangement in which there is an entrance cubicle on a roof the chamber above ground and a personnel access passage leading from the entrance cubicle to the interior of the chamber. The invention also envisages an alternative arrangement in which the mast is a hollow monopole mast which extends into the chamber and which has personnel access openings into the mast above ground and within the chamber, the personnel access openings and the interior of the mast providing a personnel access passage to the chamber.

The chamber will typically be of concrete, and possibly be at least partially of precast construction, although other materials and combinations or materials are within the scope of the invention.

The mast may carry one or more transverse, electric light-supporting arms each at an elevated position with electrical supply cables for the or each arm extending along the mast. This configuration would be particularly useful in situations where the chamber is located underground in an area alongside a road or between opposing lanes of a road.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings in which:

Figure 1 shows, in partly cut away front view, an telecommunications mast installation in accordance a first embodiment of the invention;

Figure 2 shows the installation of Figure 1 in a three dimensional, partly cut away view;

Figure 3 shows a view similar to that of Figure 1 of another embodiment of the invention; and

Figure 4 shows a view similar to that of Figure 2 of the embodiment of Figure 3.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Figures 1 and 2 of the drawings, a telecommunications mast installation in accordance with a first embodiment of the invention is generally indicated by reference numeral 10. The installation 10 comprises a foundation structure 12 which is beneath ground level indicated by reference numeral 18 and a mast 14 mounted on and supported by the structure 12. The mast 14 extends vertically upwardly and an antenna 16 is mounted to the top of the mast.

The structure 12 forms a hollow chamber. It includes a base 20 of reinforced concrete vvhich will typically have been cast *in situ*, although it may be a precast component. The chamber also includes a round cylindrical shell 22 supported on the base 20 and securely connected to the base to form an integral structure. The shell 22 is conveniently in the form

of a precast structure, or is formed of precast components. The chamber formed within the shell is designated with the reference numeral 24.

A roof 26 formed by a roof slab spans across and is supported by the shell 22. The roof 26 is securely connected to the shell and, together with the shell and base 20, forms a rigid, three dimensional, composite foundation for the mast 14.

A vertical sleeve 32 extends snugly through a hole in the roof 26 and is itself snugly located about a lower end of the mast 14. The lower end of the sleeve, coinciding with the lower extremity or foot of the mast 14, is snugly received in a recessed seat 30 provided for that purpose in the base 20. With this arrangement, vertical loading on the mast is transferred to the base 20 which serves as a structural foundation for the mast. In addition, the seat restrains lateral movements of the mast at the level of the base.

The roof 26, acting via an upper portion of the sleeve 32, laterally restrains the mast 14 at a position spaced from and directly above the seat 30. The structure 12 accordingly provides secure vertical and lateral support for the mast. It will however be understood that there is no rigid, moment-transferring connection between the mast and structure 12.

In other embodiments, not shown, the sleeve 32 may be omitted. In this case, the foot of the mast is received directly in the recessed seat 30, and is laterally restrained thereby at the level of the base, and the roof 26 applies direct lateral restraint to the mast above the base.

The interior of the chamber 24 accommodates electronic and other equipment 35 associated with the operation of the antenna 16 carried by the mast. A cubicle 36 exposed above ground level on the roof 26 provides an entrance to the chamber 24 to allow personnel access to the equipment accommodated within the chamber via a hatch 37 on the cubicle or via a door (not shown) in a side of the cubicle. In either event, it will be

understood that the cubicle communicates with the chamber through an opening extending through the roof.

In an alternative arrangement where the mast 14 is a hollow monopole, typically of steel, there may be a door or hatch in the wall of the pole above the upper end of the sleeve 32 and a corresponding door or hatch through the lower end of the mast and sleeve inside the chamber 24, with the doors or hatches and the interior of the mast itself providing personnel access to the interior of the chamber. This arrangement does away with the need for an exposed, upstanding structure, i.e. the cubicle 36, on the roof.

The chamber 24 should be ventilated or air conditioned for the sake of the electronic equipment 35 and personnel working in the chamber 24. In Figures 1 and 2 necessary air conditioning or ventilation components are housed in a further, ventilated cubicle 38 located in an exposed position on the roof 26.

In the embodiment of Figures 3 and 4, the shell 22 is rectangular in shape rather than round cylindrical as in the first embodiment. Another difference between this embodiment and that of Figures 1 and 2 is the manner in which chamber ventilation is provided. An air intake 40 is provided in the wall of the monopole mast 14 at a level just above the sleeve 32. Inside the mast air intake ducting (not visible) is provided to take air to a vent 42 in the chamber. An inlet 44 in the chamber is connected via exhaust ducting in the mast 14 to an exhaust at the top of the mast. The exhaust includes is served by an air extractor 46, typically a rotary air-driven extractor of conventional type, such as that marketed under the trade name "Whirlybird". Alternatively, the extractor may be an electrically powered suction fan or the like. It will be appreciated that there is accordingly a ventilation circuit in which ventilating air is drawn into the chamber via the intake 40, concealed intake ducting and vent 42 and is withdrawn from the chamber to the exhaust via the inlet 44 and concealed exhaust ducting.

In the absence of a personnel access cubicle on the roof 26 in the embodiment of Figures 3 and 4, it will be understood that personnel access in this will typically be via the mast itself, as described above.

In both embodiments described above the mast 14 supports transverse, light-supporting arms 50 at an elevated position. The lights 52 which are supported may, for instance, be street lights. Electricity supply cabling for the lights will typically be taken to the light fittings in concealed manner through the interior of the mast. In practice, electrical power, either mains or independently generated, will have to be supplied to the chamber 24 and equipment 35 therein, as well as air conditioning equipment if provided, and it will accordingly be a simple matter to route power from the main supply to the light fittings 52 on the arms 50.

The facility to support street lighting renders installations as described above eminently suitable for location alongside roads. This is exemplified in Figure 3, in which the opposing lanes of a highway are designated with the numeral 52 and the installation of the invention is located in the island or strip between those lanes. There may of course be only a single arm supporting a single light fitting.

It will also be understood that the antenna 16 is connected in conventional fashion to the associated equipment in the chamber by conductors extending internally along the mast 14.

The installations described above have a number of advantages compared to conventional cellular telephone network base station installations as mentioned above. One important advantage is the fact that the installations are not visually intrusive because, even with an embodiment of the kind seen in Figures 1 and 2, the structure 12 is predominantly below ground and hence is largely invisible. The fact that the chamber is below ground also makes it possible to provide a telecommunications mast right next to a road or, as described above, in the inter-lane strip of a highway. In this regard it will be understood that it will be possible to position installations

according to the invention in other locations where conventional installations would be unacceptable, for instance in building or sports complexes.

From a security point of view vulnerable electronic and other equipment associated with the operation of the antenna supported by the mast is securely positioned underground within the installation 12, obviating the need for above-ground security fencing or the like.

Yet further, the three dimensional composite foundation structure 12 securely and conveniently supports the mast 14.

Yet another advantage arises from the subterranean location of the chamber 24. Thermal inertia and the shielding effect of the soil surrounding the chamber will, it is believed, facilitate the maintenance of a suitably cool environment by ventilation or air conditioning of the chamber.

In another, less preferred embodiment of the invention, not illustrated, the foot of the mast 14 is secured rigidly to the roof slab of the chamber. Although quite feasible, and may in fact be desirable in the case of, for instance, mast of lattice construction, this is considered less desirable than the embodiments described above because it would necessitate a foundation structure, and in particular roof slab structure, robust enough to take force moments transmitted to it by the mast. This is avoided in arrangements such as those illustrated in the drawings, where the mast is supported by, but not rigidly connected to the foundation structure, with the foundation structure providing lateral restraint at the level of the base and roof and the soil surrounding the foundation structure providing the necessary passive resistance.

CLAIMS

1.

A telecommunications mast installation comprising a mast supporting a telecommunications antenna and a foundation structure supporting the mast, the foundation structure being in the form of an enclosed chamber situated at least partially underground and defining an internal space which is accessible to personnel and which accommodates electronic equipment associated with operation of the antenna.

2.

An installation according to claim 1 wherein the chamber is fully underground.

3.

An installation according to either one of the preceding claims wherein the mast has a foot at its lower end which is supported on a base of the chamber, the base acting as a structural foundation for the mast.

4.

An installation according to claim 3 wherein the foot of the mast is seated on a seat in or on the base, the seat restraining lateral movements of the foot of the mast at the base.

5.

An installation according to claim 4 wherein the chamber includes lateral support means to restrain lateral movements of the mast at a position above the base.

6

An installation according to claim 5 wherein the chamber has a roof with an opening therein through which the mast passes.

7.

An installation according to claim 6 comprising a sleeve about a lower end of the mast, the sleeve being received by the seat and passing through the opening in the roof.

8.

An installation according to either one of claims 1 or 2 wherein the mast has a foot at its lower end which is connected rigidly to a roof of the chamber.

9.

An installation according to any one of the preceding claims and comprising ventilation or air conditioning means for the interior of the chamber.

10.

An installation according to claim 9 comprising ventilation or air conditioning means housed in a cubicle mounted on a roof of the chamber above ground level and communicating with the interior of the chamber.

11.

An installation according to claim 9 wherein the ventilation means comprises a ventilation circuit which includes an air intake on the mast above ground, an air exhaust at an elevated position on the mast, air intake ducting leading from the intake to the interior of the chamber and air exhaust ducting leading from the interior of the chamber to the air exhaust.

12.

An installation according to claim 11 wherein the air exhaust is located towards the top of the mast and includes an air extractor.

13.

An installation according to either one of claims 11 or 12 wherein the mast is a hollow monopole mast, the air intake is an opening in a wall of the mast and the air intake and air exhaust ducting is concealed in the interior of the mast.

14.

An installation according to any one of the preceding claims comprising a personnel entrance cubicle on a roof of the chamber above ground and a personnel access passage leading from the entrance cubicle to the interior of the chamber.

15.

An installation according to any one of claims 1 to 13 wherein the mast is a hollow monopole mast which extends into the chamber and which has personnel access openings into the mast above ground and within the chamber, the personnel access openings and the interior of the mast providing a personnel access passage to the chamber.

16.

An installation according to any one of the preceding claims wherein the chamber is of concrete.

17.

An installation according to claim 16 wherein the chamber is at least partially of precast concrete construction.

18.

An installation according to any one of the preceding claims wherein the mast carries one or more transverse, electric light-supporting arms each at an elevated position, electrical supply cables for the or each arm extending along the mast.

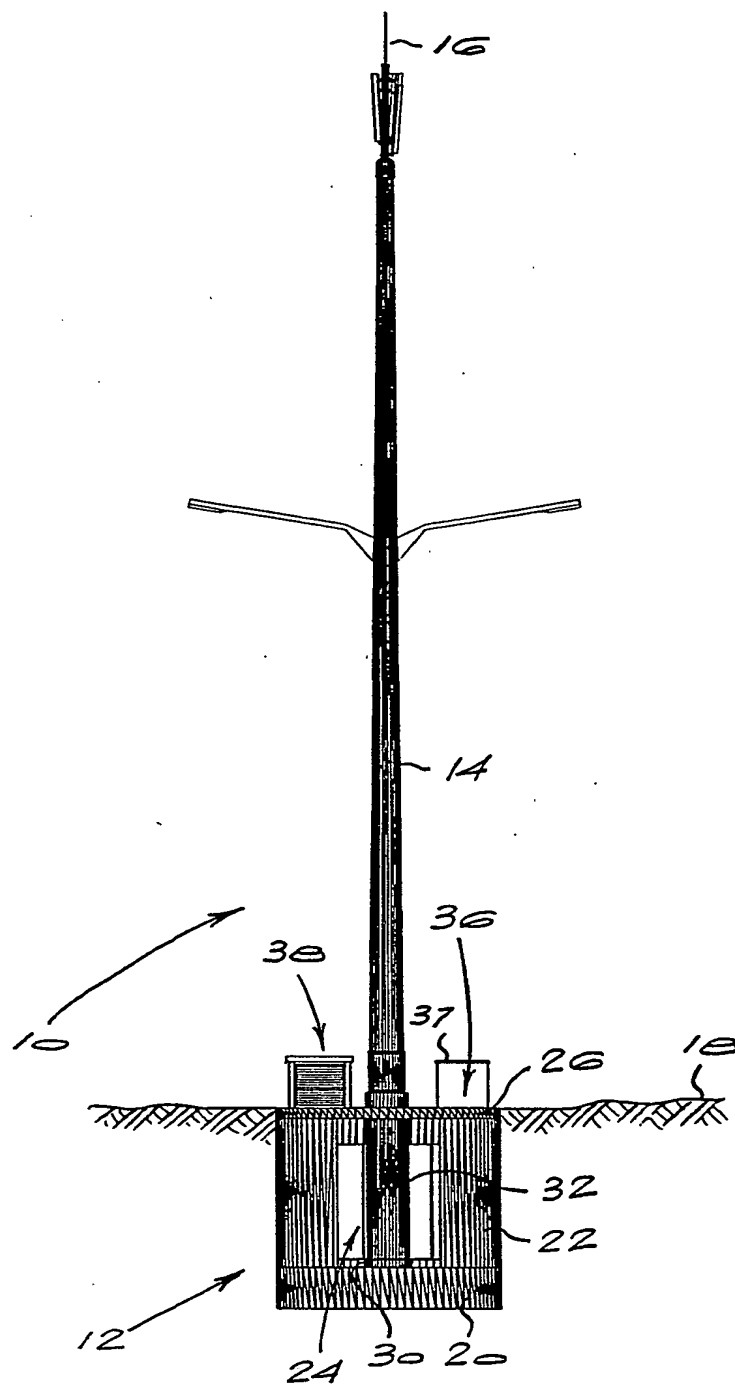
19.

An installation according to any one of the preceding claims wherein the chamber is located underground in an area alongside a road or between opposing lanes of a road.

20.

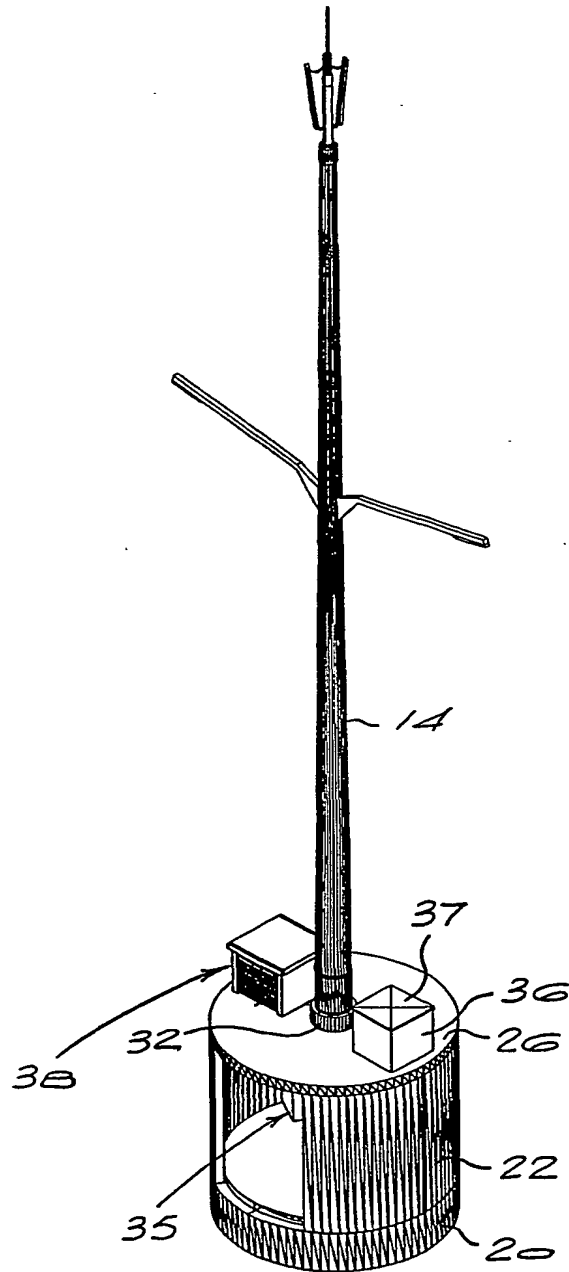
An installation substantially as herein described with reference to Figures 1 and 2 or Figures 3 and 4 of the accompanying drawings.


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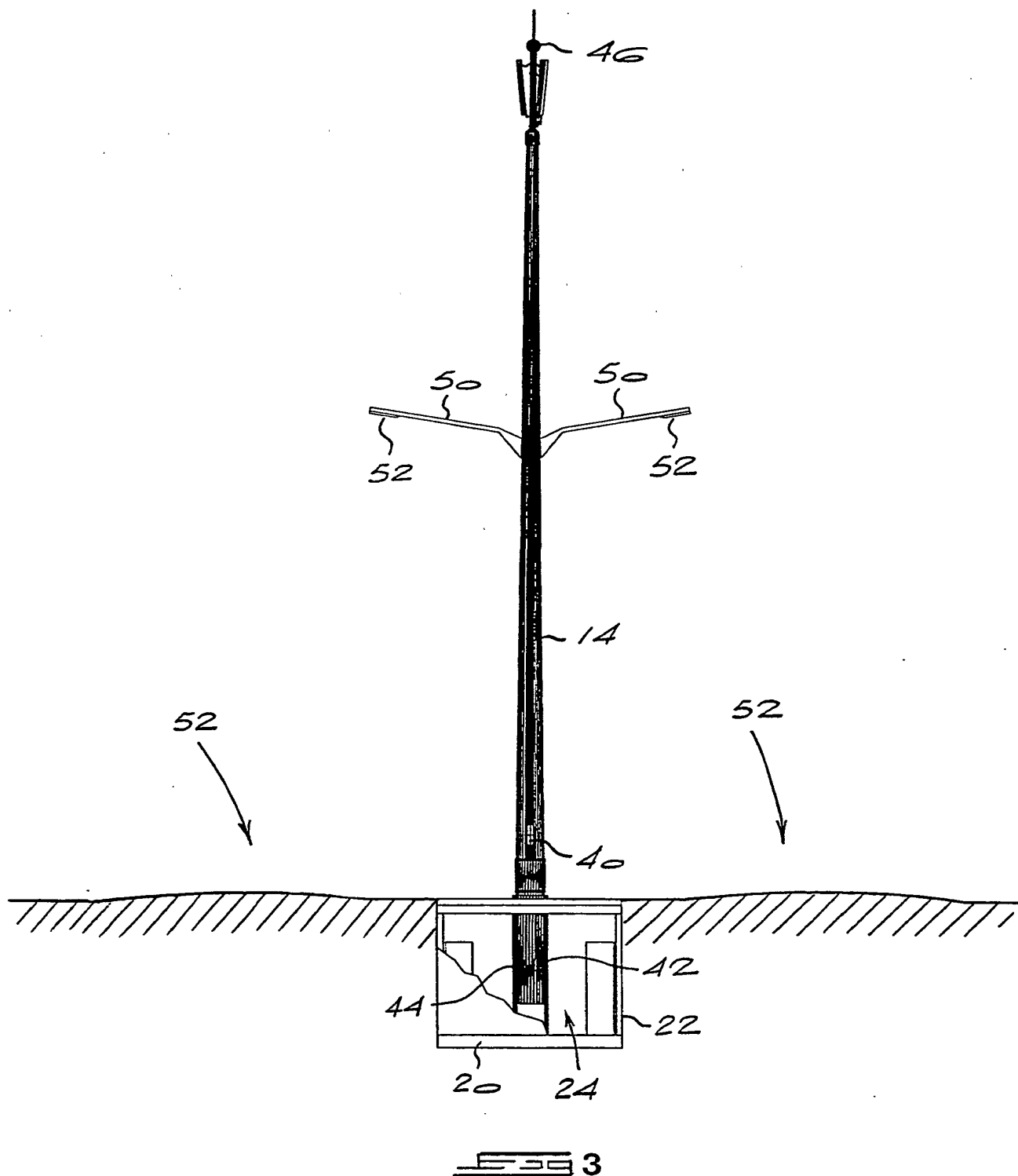
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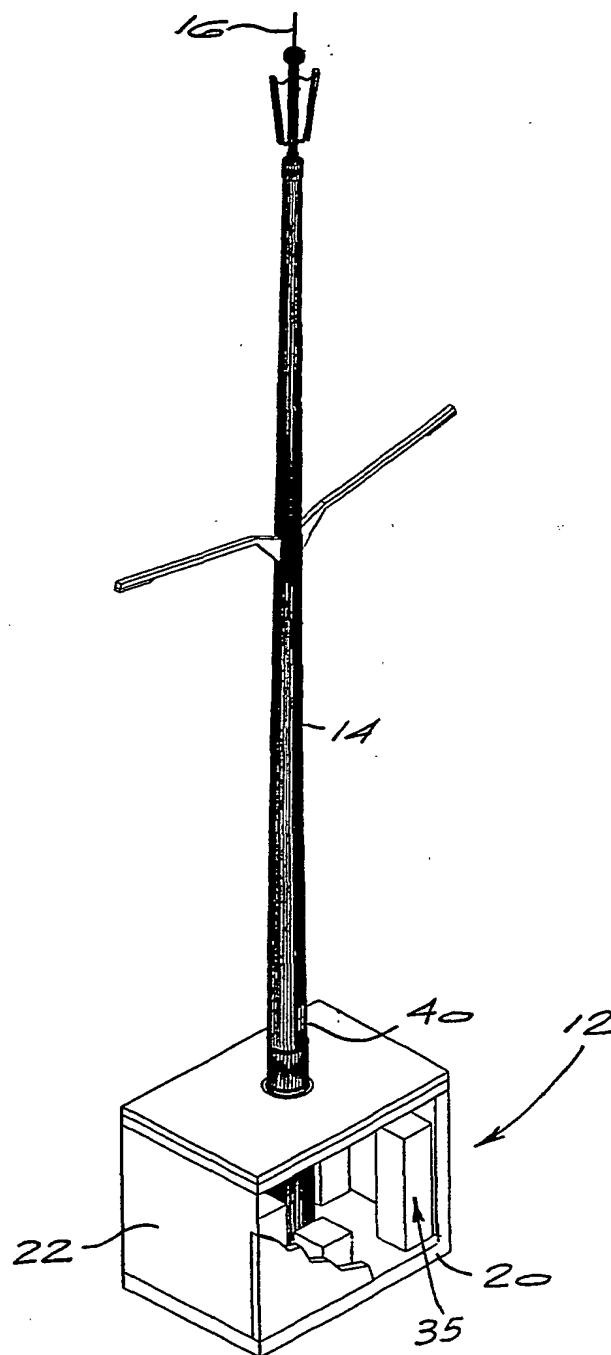


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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IB 01/00325

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H01Q1/12 H01Q1/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2 206 062 A (JOVIN COMMUNICATIONS INC) 6 December 1998 (1998-12-06) the whole document	1-3, 8-10, 14, 18-20
A	DE 197 01 229 A (LANGMATZ LIC GMBH) 23 July 1998 (1998-07-23) abstract	1-20
A	GB 2 289 827 A (MOTOROLA LTD) 29 November 1995 (1995-11-29) abstract	9-13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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- *G* document member of the same patent family

Date of the actual completion of the international search

15 August 2001

Date of mailing of the international search report

22/08/2001

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inventor's Application No

PCT/IB 01/00325

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 2206062 A	06-12-1998	NONE	
DE 19701229 A	23-07-1998	NONE	
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